

# Claims

[c1] What is claimed is:

1. A portable welding-type power source comprising:  
an energy storage device configured to provide a first voltage output; and  
a boost circuit connected to the energy storage device and configured to boost the first voltage output to a second voltage output to supply power to the welding-type power source according to a selected welding-type process.

[c2] 2. The welding-type power source of claim 1 wherein the boost circuit comprises a boost converter.

[c3] 3. The welding-type power source of claim 1 further comprising a chopper circuit configured to receive the second voltage output and convert the second voltage output to a power output matched to the selected welding-type process.

[c4] 4. The welding-type power source of claim 3 wherein the chopper circuit comprises a buck converter.

[c5] 5. The welding-type power source of claim 3 further comprising at least one control module to control the

boost circuit and the chopper circuit according to the selected welding-type process.

- [c6] 6. The welding-type power source of claim 5 wherein the control module further comprises a first control circuit to control operation of the boost circuit and a second control circuit to control operation of the chopper circuit.
- [c7] 7. The welding-type power source of claim 6 wherein the first and the second control circuits are controlled by a common clock signal such that a required mutual capacitance between the boost circuit and the chopper circuit is reduced.
- [c8] 8. The welding-type power source of claim 3 wherein the power output includes a required output voltage and current range that varies according to the selected welding-type process and wherein the second circuit is controlled to regulate the second voltage output according to the selected welding-type process.
- [c9] 9. The welding-type power source of claim 1 wherein the energy storage device is readily interchangeable with replacement energy storage devices.
- [c10] 10. The welding-type power source of claim 1 wherein the selected welding-type process is one of a shielded metal arc welding-type process, gas metal arc welding

process, gas tungsten arc welding process, plasma cutting process, and a heating apparatus.

- [c11] 11. The welding-type power source of claim 1 wherein the energy storage device is a battery pack that is interchangeable with other battery packs.
- [c12] 12. The welding-type power source of claim 1 further comprising a charger configured to receive power from an external source.
- [c13] 13. The welding-type power source of claim 12 wherein the charger is configured to be removable.
- [c14] 14. The welding-type power source of claim 12 wherein the charger further comprising a charging circuit and wherein the energy storage device may be recharged via the charging circuit.
- [c15] 15. The welding-type power source of claim 14 wherein the charging circuit is configured to receive power from an external power source to provide the energy storage device with recharging power.
- [c16] 16. The welding-type power source of claim 15 wherein the external power source is one of a transmission power receptacle, a portable generator, a generator and turbine, a fuel cell, a vehicle, and a scissors lift .

- [c17] 17. The welding-type power source of claim 14 wherein the charging circuit is configured to supplement the second voltage output during the selected welding-type process when the charging circuit is provided with power from an external power source.
- [c18] 18. A method of performing a welding-type process comprising:  
receiving an input voltage from an energy storage device that is below a desired output voltage;  
increasing the input voltage at least to the desired output voltage of the welding-type process; and  
regulating the increased voltage to supply the desired output voltage and current of the welding-type process at an output of a welding-type apparatus.
- [c19] 19. The method of claim 18 further comprising receiving a charging voltage from an external power supply and providing the charging voltage to the energy storage device to recharge the energy storage device.
- [c20] 20. The method of claim 19 further comprising supplementing the input voltage with the charging voltage.
- [c21] 21. The method of claim 18 wherein the welding-type process is one of shielded metal arc welding, gas metal arc welding, gas tungsten arc welding, plasma cutting,

and a heating apparatus.

[c22] 22. The method of claim 18 further comprising adjusting the desired output voltage and current according to the welding-type process.

[c23] 23. A portable welding-type apparatus comprising:  
an interchangeable energy storage device configured to provide an output voltage less than a required voltage range for a welding-type process;  
a first converter connected to the energy storage device and configured to increase the output voltage of the energy storage device; and  
a second converter to receive the increased output voltage from the first converter and regulate the increased output voltage to within the required voltage and current range for the welding-type process.

[c24] 24. The portable welding-type apparatus of claim 23 wherein the second converter is configured to regulate the increased output voltage to within a required voltage and current range for a plurality of welding-type process with a plurality of required voltage and current ranges.

[c25] 25. The portable welding-type apparatus of claim 23 further comprising a control module including at least one control circuit to control the first converter and the

second converter.

- [c26] 26. The portable welding-type apparatus of claim 23 further comprising a charger configured to supply a charging voltage to the interchangeable energy storage device.
- [c27] 27. The portable welding-type apparatus of claim 23 further comprising an interchangeable control module configured to control operation of welding-type apparatus to operate according to one of a plurality of welding-type processes.
- [c28] 28. The portable welding-type apparatus of claim 27 further comprising a user input control configured to receive user selection of one of the plurality of welding-type processes and wherein upon receipt of the user selection the user input control determines whether the interchangeable control module corresponds to the user-selected welding-type process.
- [c29] 29. The portable welding-type apparatus of claim 28 wherein the first converter is further configured to increase the output voltage of the energy storage device and the second converter is further configured to regulate the increased output voltage to within the required voltage and current range for the user-selected welding-

type process upon confirmation from the user input control that the interchangeable control module corresponds to the particular welding-type process.

- [c30] 30. The portable welding-type apparatus of claim 28 wherein user input control is further configured to preclude the welding-type apparatus from operating according to the user-selected welding-type process if the interchangeable control module does not corresponds to the user-selected welding-type process.
- [c31] 31. The portable welding-type apparatus of claim 27 wherein the interchangeable control module further comprises a first control circuit to control the operation of the first converter and a second control circuit to control the operation of the second converter.
- [c32] 32. The portable welding-type apparatus of claim 27 wherein the plurality of welding-type processes at least includes a GMAW type process and a SMAW type process.
- [c33] 33. The portable welding-type apparatus of claim 23 wherein the first converter and the second converter comprise at least one of a boost circuit, a buck converter, forward converter, a resonant converter, a Cuk converter, a full-bridge converter, a voltage multiplier, and a half-bridge converter.

- [c34] 34. The portable welding-type apparatus of claim 23 wherein an output of the welding-type apparatus may be one of a constant current output and a constant voltage output as derived from the increased output voltage.
- [c35] 35. A rechargeable battery configured for use with a welding-type apparatus having an output less than that required by the welding-type apparatus.
- [c36] 36. An apparatus comprising:  
an interchangeable energy storage device configured to provide a first voltage output;  
a boost circuit connected to the energy storage device and configured to boost the first voltage output to a second voltage output; and  
a buck converter to receive the second voltage output from the boost circuit and regulate the second voltage output to be within a voltage and current range required by the apparatus.
- [c37] 37. The apparatus of claim 36 further comprising a charger configured to recharge the interchangeable energy storage device from an external power source.
- [c38] 38. The apparatus of claim 37 wherein charger is integrated with the external power source.



- [c39] 39. The apparatus of claim 38 wherein the charger and external power source comprise one of a vehicle, a turbine, a fuel cell, and a generator.
- [c40] 40. The apparatus of claim 36 wherein the apparatus comprises one of a vehicle, a turbine, a fuel cell, and a generator.
- [c41] 41. An interchangeable control module comprising:  
a housing;  
a socket extending from the housing and configured for repeated engagement and disengagement with a welding-type apparatus; and  
a control circuit enclosed within the housing and configured to control operation of the welding-type apparatus according to at least one of a plurality of operating modes.
- [c42] 42. The interchangeable control module of claim 41 wherein the plurality of operating modes includes at least a GMAW operating mode and a SMAW operating mode.
- [c43] 43. The interchangeable control module of claim 41 wherein the control circuit is configured to control the operation of a boost circuit and a buck circuit of the welding-type apparatus according to an operating mode

of the control circuit.

- [c44] 44. The interchangeable control module of claim 41 wherein the control circuit is configured to control the boost circuit to boost an output voltage of an energy storage device.
- [c45] 45. The interchangeable control module of claim 41 wherein the control circuit is configured to control the buck circuit to receive the boosted output voltage from the boost circuit and regulate the boosted output voltage to be within a required voltage range associated with the operating mode of the control circuit.